Active Project (2016 - 2018)

Additively Manufactured Monolithic LOx/Methane Vortex RCS Thruster, Phase II Project

SBIR/STTR Programs | Space Technology Mission Directorate (STMD)

ABSTRACT

Parabilis Space Technologies proposes to advance development of an additively manufactured liquid oxygen (LOx) and liquid methane Reaction Control System (RCS) thruster in response to solicitation H2.01, In-Space Chemical Propulsion. This RCS-class thruster will provide a simple, robust, and low-cost solution for vehicle attitude control on upcoming NASA projects. The thruster is additively manufactured in a single monolithic structure with minimal secondary processing. During Phase I, a prototype thruster was successfully designed, fabricated, and test fired multiple times. Phase II efforts include furthering the development of the thruster toward flight ready design, including expanding on additive manufacturing implementation and performing additional hotfire testing to evaluate a flight-like design and expand the operational envelope.

ANTICIPATED BENEFITS

To NASA funded missions:

Potential NASA Commercial Applications: The proposed thruster innovations are applicable to a number of proposed future NASA missions such as Mars exploration as well as NASA next generation launch vehicle upper stages. Future launch vehicles utilizing LOx/methane as their main propulsion system can utilize the proposed innovation as complementary reaction control system thrusters. The technology could also be a key enabler for all deep space manned missions where the need to service and repair or replace components in transit could be critical to mission success. Additionally, the technology can be scaled for use as a kick stage or orbital insertion engine.

To the commercial space industry:

Potential Non-NASA Commercial Applications: LOx/methane is an attractive propellant combination for commercial launch vehicles. Potential customers for a LOx/methane RCS engine include United Launch Alliance (ULA), SpaceX, Blue Origin,

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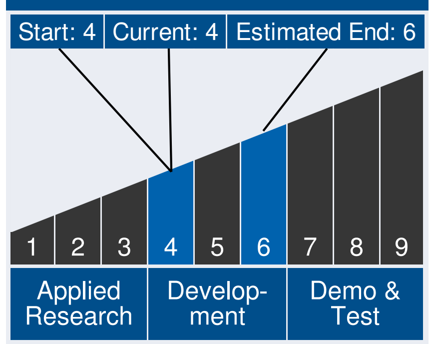
Technology Maturity



Management Team

Program Executives:

- Joseph Grant
- Laguduva Kubendran

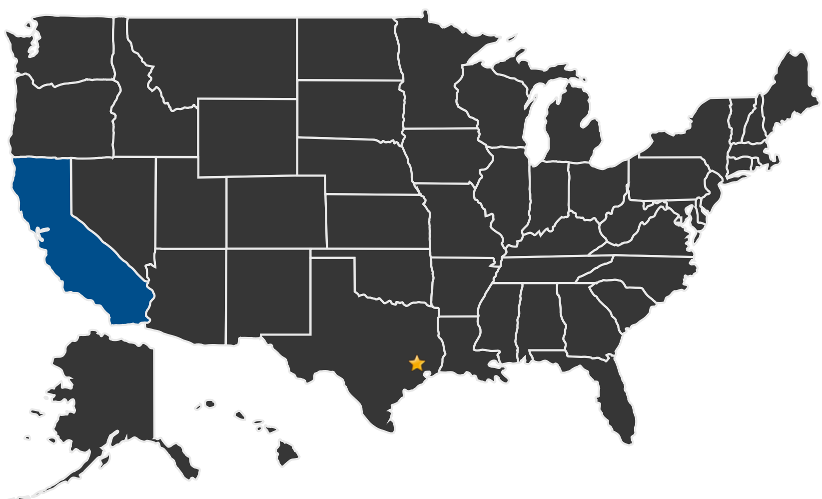
Program Manager:

- Carlos Torrez

Continued on following page.

XCOR, Armadillo Aerospace, Northrup Grumman, Aerojet and Firefly, among others. Each of these organizations has propulsion systems that utilize the LOx/methane propellant combination in development. Beyond LOx/methane, the technology developed in this proposal could also be developed into products that could exploit the entire range of bi-propellant combinations, opening the range of applications to include most launch vehicles currently in development.

U.S. WORK LOCATIONS AND KEY PARTNERS



U.S. States With Work

Lead Center:
Johnson Space Center

Other Organizations Performing Work:

- Parabilis Space Technologies, Inc. (San Marcos, CA)

PROJECT LIBRARY

Presentations

- Briefing Chart
  - (http://techport.nasa.gov:80/file/23587)

Management Team *(cont.)*

Principal Investigator:

- Christopher Grainger

Technology Areas

Primary Technology Area:
In-Space Propulsion Technologies (TA 2)
└─ Supporting Technologies (TA 2.4)
  └─ Materials and Manufacturing Technologies (TA 2.4.3)

IMAGE GALLERY

Additively Manufactured Monolithic LOx/Methane Vortex RCS Thruster, Phase II

DETAILS FOR TECHNOLOGY 1

Technology Title

Additively Manufactured Monolithic LOx/Methane Vortex RCS Thruster, Phase II

Potential Applications

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